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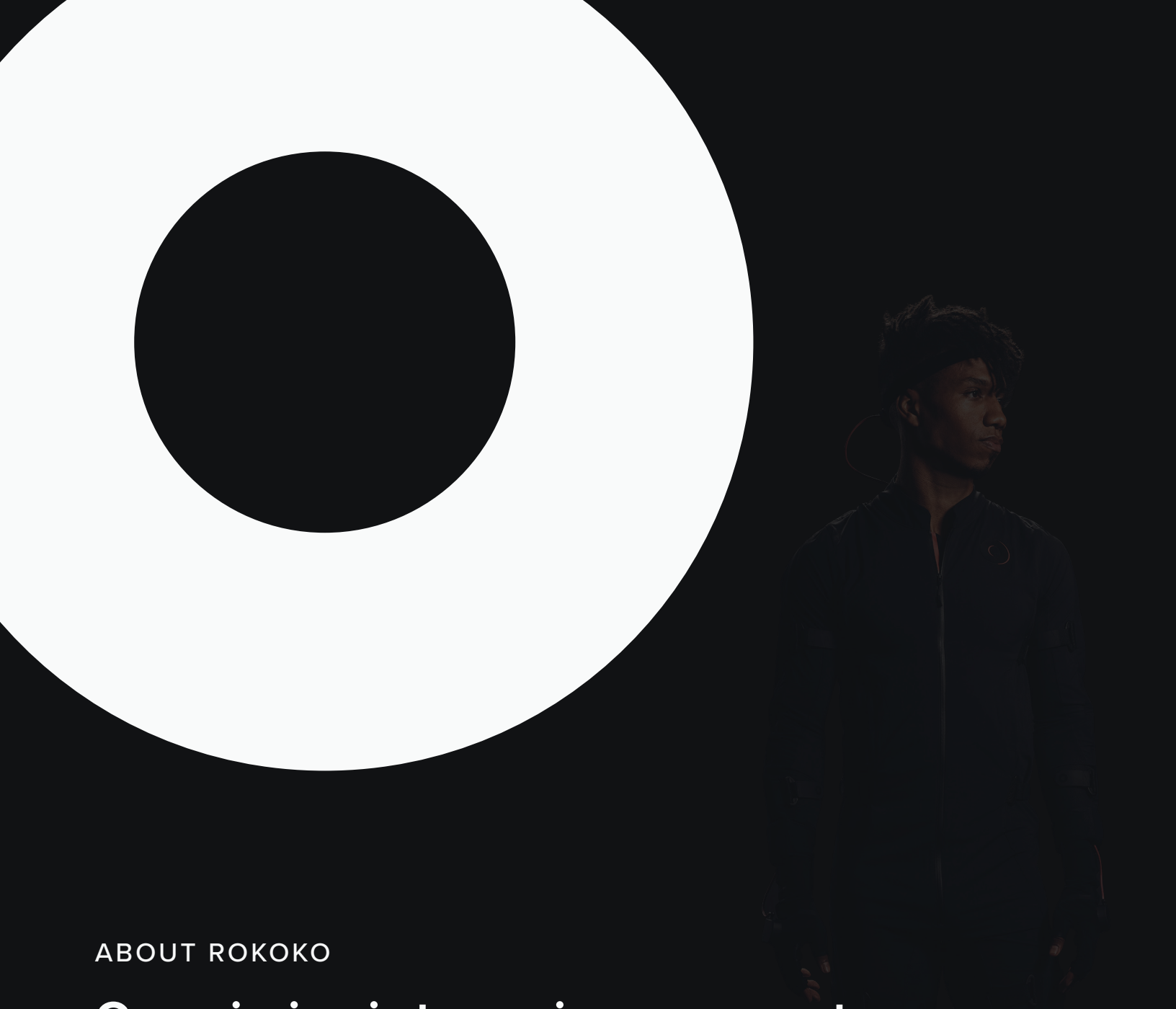
The Ultimate Guide: Pre-Rigged 3D Models

A crash course in character rigs, how to use them, and which ones are worth buying.

James Johnson
'Home Workout'



ABOUT ROKOKO

Our mission is to equip every creator, big or small, with the power of animation

Our tools unlock studio-quality motion capture for the entire body, fingers, and face, which can be integrated into your final animation software or game-engine for real-time streaming.

We pride ourselves on democratizing animation, thanks to the affordability, intuitiveness, and mobility of our tools that are used by over **30.000 creators worldwide.**

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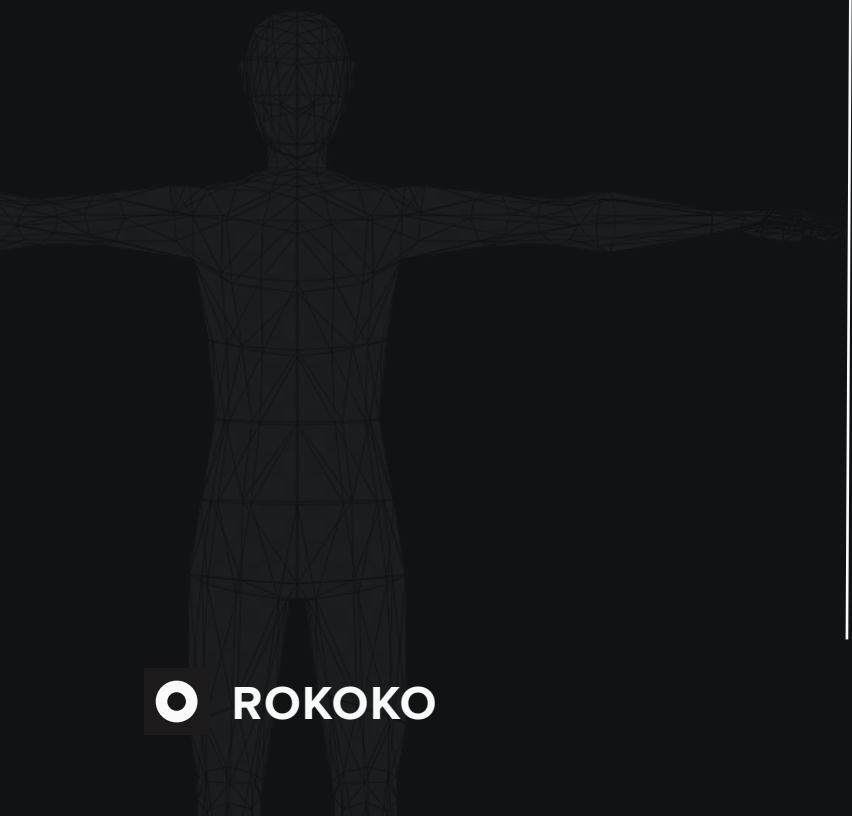
INTRODUCTION

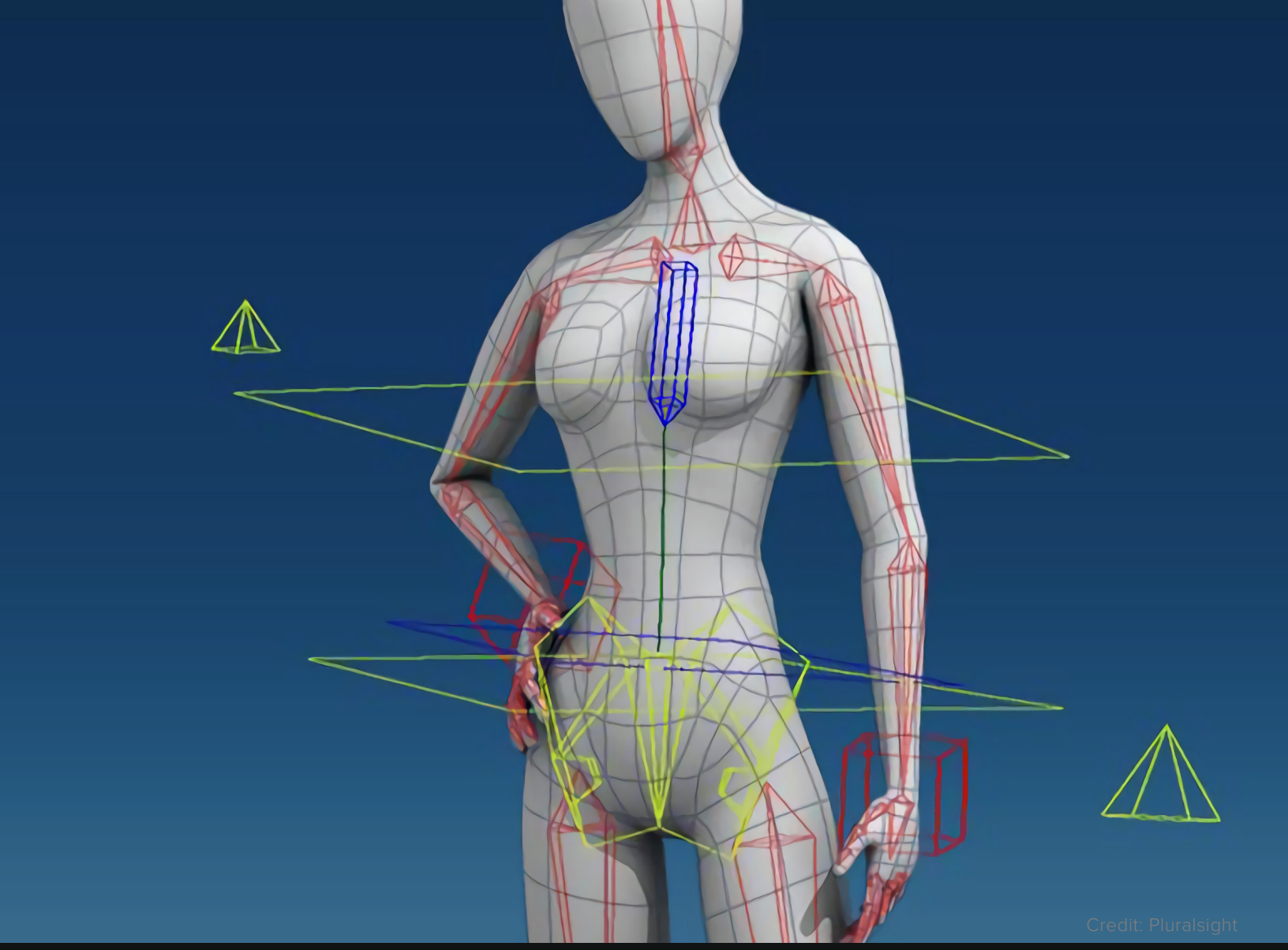
Wait... IK vs FK? What's that?

This book is designed to assist beginners, intermediates, and yup, even seasoned animators looking for quick, reliable intel.

New to rigging? We've got a ton of content coming right up. Don't skip past the first chapter - it explains the basics so you'll know what we're talking about later on.

Animate in your sleep? Skip to Chapter 2. That's where our deep dive begins.





CHAPTER 01

3D Rigs Explained

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CHAPTER 01

What is 3D Rigging?

3D rigging is the process of adding controls to a character mesh. Without a rig, your character can't move. In fact, even objects are given simple rigs if they need to interact with a character in a scene.

A character rig is used to animate characters by keyframe or with motion capture.

There are two main types of rig controls; **Forward-Kinematics (FK) and Inverse-Kinematics (IK).** FK rigs allow for more mechanical movement as you have total control of each joint's rotation and position. IK rigs are more advanced as they move an entire chain of joints. For example, if someone grabbed your wrist and pulled it to the left, your elbow joint would move and your shoulder joint might even rotate — that's the basic premise of IK rigs (more on this in a bit).

Most pre-rigged characters have a "Control Rig"

A control rig is a set of predefined controls that directly influence the movement of the character's skeletal system. While there's a lot going on behind the scenes of a rig, all arrows, icons, or wire shapes (often in bright green) are a part of the control rig that you'll use to move the character.

The skeletal system of any rig will mimic the bone structure of the subject (eg. human body, human skeletal bone structure). A character mesh is skinned to this skeletal system. From there on, the movement of the rig will move the vertices of the character mesh.

This is what creates the illusion of motion.

Credit: Maya ZooTools

CHAPTER 01

Types of controls you'll find in a typical rig

Every rig should be built with these controls to allow animators the best movement possible.

World Control

The world control is typically located at the very top of the control rig hierarchy. Moving the world control will move the situation of the rig in 3D space. The world control is only used to position your character in 3D space — it's never used to animate the character,

Root Control

Root control is ground zero for all controls. The root control is most often used for translational movement. For example, many animators start with an in-place walk-cycle. If you want that walk to actually go somewhere in 3D space, you'll need to move the root control at the correct speed.

Attribute Slider

Attribute sliders influence a wide array of elements, from blendshapes to translation of other bones. They are often reserved for actions that are otherwise unachievable through a typical bone rig setup. These sliders vary from rig to rig.

A common inclusion is FK/IK blending. Great for when an animator needs to switch from one type of control rig manipulation to another. For example, during a 'kick animation' an animator may opt to use FK for the action kick, but blend to IK when the character's foot touches the floor.

Blendshapes

A blendshape morphs and deforms a mesh in a specific, controlled way. For example in facial animation which requires complex mesh manipulation, blendshapes are a requirement (working in conjunction with an FK rig to control jaw and tongue movement)

You might also find "Corrective Blendshapes"within the rig controls of a character's body. These help fix unavoidable mesh deformations that occurred during the skinning process. These don't need to be manipulated by you directly.

Squash and Stretch

A derivative of blendshapes, squash and stretch is a control feature that is used to mimic the squash and stretch action often used in 2D animation. Riggers typically achieve this through a blendshape in conjunction with a complex bone setup that deforms the mesh by pulling it apart. Realistic rigs and stylized rigs can both benefit from this feature, though the latter is most common.

Corrective Controls

Corrective controls are often present in rigs in order to fix issues in certain poses. Unlike corrective blendshapes, they can be manipulated at the animator's discretion. However, depending on the rig they can also exist as driven controls. They are usually bound to small sections of the model in order to make fine, minute adjustments to the overall shape of the mesh (e.g. forearm deformations).

Cloth and Hair Controls

Generally, cloth and hair are rigged in FK for easy incorporation of overlapping lines and curves. Being rigged in FK also means that the animator can also run fake-dynamic scripts or basic dynamic simulations.

Animators can also set these controls using driven keys, so that when they move a limb in a certain direction the cloth control follows corroding, essentially doing all the "cloth animation" for them.

External Controls

External Controls, as the name implies, exist "outside" the rig. These range from standard eye drivers or as vessels for driven controls and/or blendshapes. They are typically universal in usage and it is up to the rigger to decide what they want to achieve with external nodes.

Rig Picker

While not strictly a control, you can use a rig picker to select controls via a separate 2D menu (instead of via the viewport controls or side panel). Use of this menu depends completely on the animator's preferred method.

Is there a difference between the rig you need for motion capture, and the one you need for keyframe animation?

A good rig is a good rig. Any fully rigged character can be used for both motion capture and animation.

You can however create simple character rigs for your character using tools like Mixamo and MotionBuilder. These tools create extremely simple biped rigs that you can use for fast character animation. It's a great option for background characters or when speed is more important than quality.

In most cases, we advise against short changing yourself when choosing a pre-made rig and character mesh. It's better to have the options at your fingertips — even if you don't end up using them.

CHAPTER 01

Workflows for Animation

There are many software options for 3D artists, each bringing their pros and cons. We suggest you choose the software most suitable to your project over choosing based on perceived workflow convenience.

Animation & Rigging Workflow in Maya, Blender and Cinema 4D

By and large, the vast majority of rigs in these programs have the same functions and operations. They tend to look similar and all use a control rig system to actually animate a character.

After rigging the initial skeletal system, riggers will "bind" the character mesh to the bones and manually tweak the effects (this process is called skinning). After adding the controls, a 3D artist will begin to tweak areas of the rig to avoid "breaking" or unusual deformations in the character mesh.

Rigs are not compatible cross-program due to differing implementations of IK solvers.

Keyframe animation:

Keyframe animation in these programs requires manually setting key positions for each of the characters bones. It is the most common type of animation.

Motion capture animation:

Motion capture animation is achieved through retargeting mocap data onto a rig. This re-targeting process is usually achieved via a plugin (here's a free one). There are plenty of tutorials for this process online.

Animation & Rigging Workflow in Unity and Unreal Engine

Unity and Unreal Engine are first and foremost game engines; they're used to create games. This means they optimize your computer's resources to keep frame rates high and render in real-time. In recent years, Unreal Engine has become exceedingly popular with virtual live streamers (known as "vtubers" who use a virtual avatar). Others have used Unreal and motion capture to build highly accurate pre-vis sets for productions (known as virtual productions). Finally, some have gone so far as to use Unreal for virtual event productions like music concerts.

Keyframe animation:

Keyframe animation in game engines is rudimentary. Most keyframe animation is done via more animation-friendly software and baked into the character bones

Motion capture animation:

Motion capture can either be pre-recorded or recorded live in game engines via a plugin (here's a free one). All you need to do is re-target the animation and you're done. There are plenty of tutorials for this process online.

Credit: Stickman

CHAPTER 02

Best Character Rigs for Beginners

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CHAPTER 02

Flour Sack Character Rig

The flour sack rig is a very basic, barebones stylized rig. It's best for your first animation project or quick and simple short films. While it's excellent for stylized animations, it's not suitable for motion capture and has to be animated by hand.

Skeletal System

The skeletal system for the flour sack rig is rather ingenious and rather creative. As the rigger had to solve rather niche and specific problems not found in typical biped characters.

The X-shape skeletal structure for the limbs with the addition of two supporting bones above and below the root bone make it easy to convey the action of bending over and sitting down.

Controls:

The flour sack rig uses standard FK controls for the "hands" and "feet" (no IK options). The main body uses two IK controls for the upper and lower body, with a pole vector in the middle so you can show a shift in weight. There are locators on the top and bottom of the rig that are bound to a driven key which modifies the overall fatness of the character.

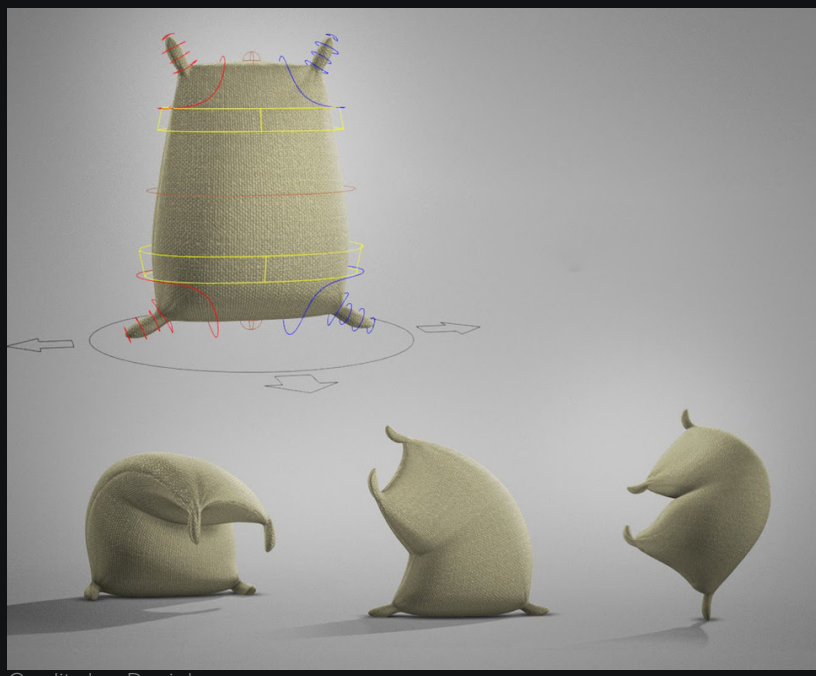
Available Controls:

- Facial: None
- Head and Neck: FK Only
- Spine: IK Only (Squash & Stretch)
- Arms: FK Only
- Fingers: None
- Legs: FK Only
- Feet: FK
- Extra: None

Compatibility

Works with Maya 2013 and up.

Download it here for free



Credit: Joe Daniels

CHAPTER 02

Boney Character Rig

The Boney rig contains all the essential features of a good, standard control rig. It has everything you need in order to create realistic and stylized animations. Due to the character's mesh, it's perfect for keyframe training purposes and motion capture retargeting tests.

Skeletal System

Don't be fooled by this character mesh's simplistic design. The bone structure of the rig is complex with free floating bones and multi-bone limbs that work together to provide IK and FK at the same time. This rig also allows squash and stretch for every limb and even within the spine. Don't be afraid of the rig's underlying complexity, the controls still make it simple to use.

Controls

The controls for this rig are rather simplistic, robust and straight-forward. The main controls are nice and large for easy selecting, The FK and IK controls are clearly distinguishable from each other and clearly indicate what they do and the left and right sides are conveniently colour-coded. There are also external controls that house the FK/IK blending feature.

Available Controls:

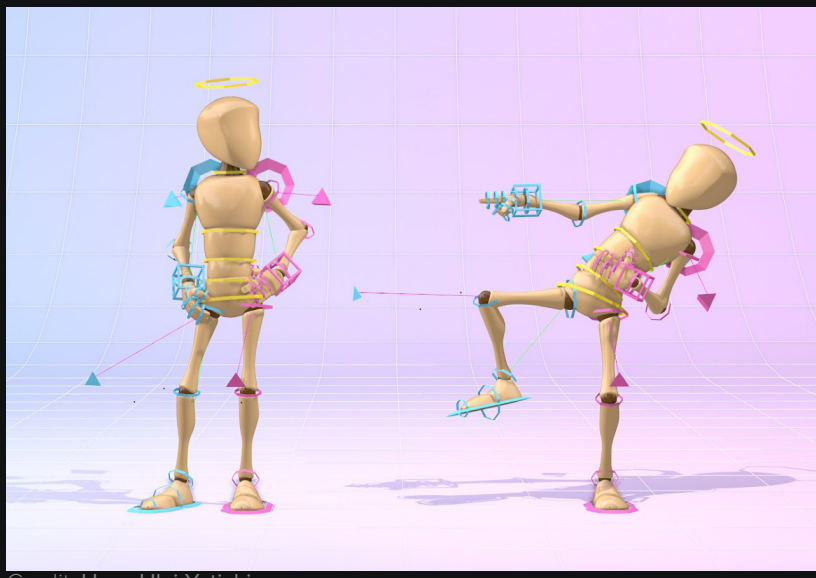
- Facial: None
- Head and Neck: FK Only
- Spine: FK (S&S) - IK (S&S) (At the same time)
- Arms: FK (S&S) - IK (S&S)
- Fingers: FK Only
- Legs: FK (S&S) - IK (S&S)
- Feet: FK
- Extra: None

Compatibility

The Boney rig was originally built in Maya, but has been adapted to Cinema 4D. The C4D version is slightly more simplistic than the Maya version.

Download the Maya version here for free

Download the Cinema 4D version here for free



Credit: Ugur Ulvi Yetiskin

CHAPTER 02

Jack Character Rig (Body Mechanics)

The Jack rig has a ton of well-thought-out corrective and animation features. It's easy to retarget human IK motion. This rig is quite flexible and provides a large number of corrective attributes that make your animation workflow faster and smoother.

While this is a paid rig, the Body Mechanics pack includes 12 different characters of all genders and proportions. Each rig is relatively similar to the Jack rig.

Skeletal System

Just like the Boney rig, the Jack rig looks simplistic on the outside but has a relatively complex underlying system. It follows the standard format of a biped rig, with three bones in each limb for better squash and stretch controls. The limbs are also detached from the spine allowing for finer stylistic control.

Controls

This control rig mostly follows standard practices, making it an excellent choice for students preparing for professional work. The available IK controls have a unique characteristic in which they utilize a pole vector that has been connected to the hips or shoulder instead of a traditional free-floating pole vector. Fingers are also animated via attribute sliders.

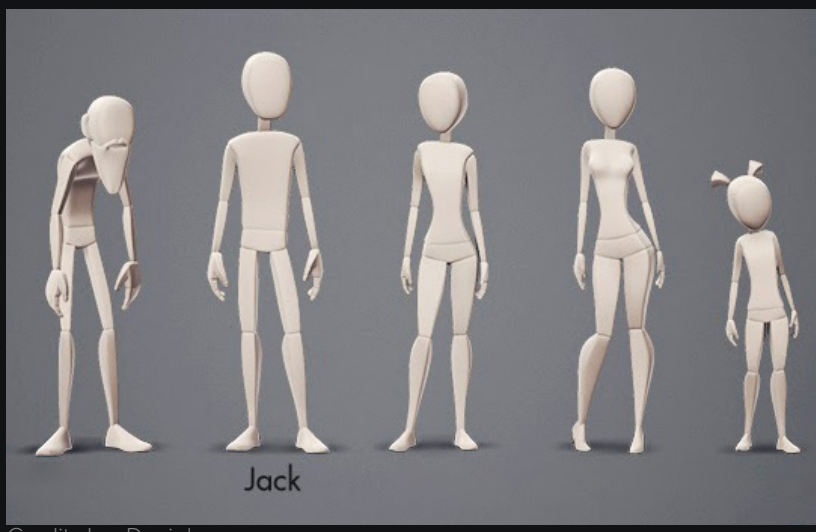
Available Controls:

- Facial: FK Jaw
- Head and Neck: FK Only
- Spine: FK (S&S) - IK (S&S)
- Arms: FK/IK (S&S)
- Fingers: Attribute Sliders - IK
- Legs: FK - IK (S&S)
- Feet: FK
- Extra: None

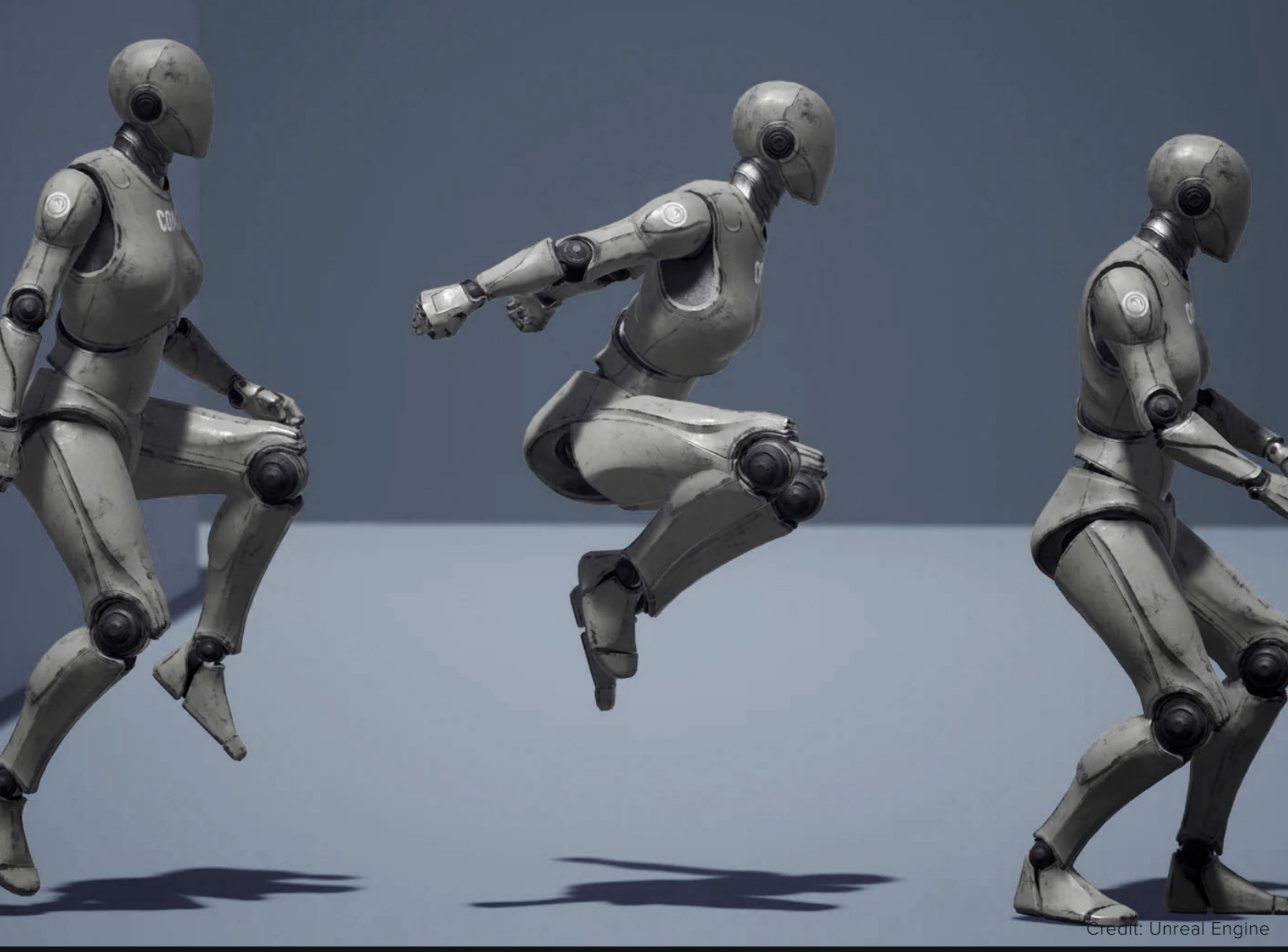
Compatibility

Works with Maya 2014 and up.

Download it here for $40



Credit: Joe Daniels



Credit: Unreal Engine

CHAPTER 03

Best Character Rigs for Students, Game Prototypes, and Non-Commercial Purposes

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CHAPTER 03

Sam Character Rig

The Sam rig and character mesh is useful to anyone in need of a realistic, Pixar-style 3D model. The Sam rig utilizes an Advanced Skeleton for its rigging pipeline making motion capture retargeting simple and accurate. It has every function and attribute that you expect in a complete rig.

You can only use the Sam rig for non-commercial or educational purposes. However it's still a great one to pop in your showreel!

Skeletal System

Sam's skeletal system is surprisingly simple for the accuracy of animation you can achieve. Each limb includes three Advanced Skeleton twist bones to allow realistic mesh rotation at key points.

Controls

The rig provides a comprehensive amount of controls that greatly assists the animator in their workflow. There's nothing special to say about the control rig — and that's a good thing. The well-planned controls make animation as simple as it can be.

Available Controls:

Facial: Joint Based, Blendshapes with FACs

Head and Neck: FK Only (S&S)

Spine: FK - IK (S&S)

Arms: FK - IK (S&S)

Fingers: FK Only (S&S)

Legs: FK - IK (S&S)

Feet: FK Only

Extra: FK Hair

Compatibility

Works with Maya 2017 and up.

Download it here for $15

Credit: Gabriel Salas

CHAPTER 03

Azri Character Rig

Azri is designed for game animation and is optimized specifically for game-related animations. This simple character is easily animated and maneuvered. The rig includes cloth and hair rigging. Azri is one of the most versatile and user-friendly rigs on this list!

Skeletal System

Most complexity in this rig comes from the bones driving cloth and hair animation. Apart from that, the skeletal structure is relatively simple and streamlined for game animation. Thanks to the standard skeleton design, motion capture retargeting rarely throws up errors.

Controls

The Azri controls have been thoughtfully laid out. It's easy to identify what each control does, and control layers are toggleable for added convenience. FK and IK switches are natively placed in the limb controls.

Available Controls:

Facial: Joint Based with FACs

Head and Neck: FK/IK

Spine: FK, with S&S/IK, with S&S

Arms: FK, with S&S/IK, with S&S

Fingers: FK, with S&S/IK

Legs: FK, with S&S/IK, with S&S

Feet: FK, with S&S

Extra: FK Clothing and Hair

Compatibility

Works with Maya 2019 and up.

Download it here for free

Credit: Game Anim/Jonathan Cooper

CHAPTER 04

Best Character Rigs for Commercial Purposes

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CHAPTER 04

Miosha Character Rig

The Miosha rig is an expertly crafted, industry-level control rig that contains advanced facial feature controls and blendshapes, easy hair animation, and excellent motion control free of deformation. As with most rigs using an Advanced Skeleton — Miosha is an excellent option for more detailed motion capture animation. With a vast number of corrective controls, you'll find tweaking animation fast and efficient.

Skeletal System

Miosha uses the Advanced Skeleton's default biped fit skeleton for it's bone structure. However, the skeletal system has been modified to create a unique, extremely flexible control rig — a goal achieved with expertly placed twist joints. One of the unique features of the bone structure of this skeleton is the inclusion of breast and buttocks bones to better fit the female anatomy.

Controls

While the Mosha rig is considered to be quite advanced by most animators, a vast amount of effort has gone into making the rig controls easy to navigate, understand, and use.

Available Controls:

Facial: Joint Based with Blendshapes

Head and Neck: FK Only (S&S)

Spine: FK (S&S) - IK (S&S)

Arms: FK (S&S) - IK (S&S)

Fingers: FK (S&S) - IK (S&S)

Legs: FK - IK, (S&S)

Feet: FK (S&S)

Extra: FK Clothing (S&S) - Hair

Compatibility

Works with Maya 2017 and up.

Download it here.

$25 for a student license.

$600 for a commercial license.

Credit: Alexandra Volkova & Andrey Lizunov

CHAPTER 04

Neka Character Rig

The Neka rig is designed solely for film-type keyframe animation and isn't particularly compatible with motion capture or game animations. The rig is clearly developed for detail-oriented animators who want granular control.

Skeletal System

Opening the outliner of this rig just shows the pure complexity of the Neka rig. You'll see a complicated skeletal system consisting of multiple free-floating bones, duplicate joints, segmented limbs, complicated locator wiring system and an extensive parenting system. The major positive of such a complex system is flexibility and animator control.

Controls

The controls for the Neka character are non-standard, as they use curves with thickness rather than thin lines. Each major joint has corrective sub-controls and you can also find corrective bend controls within the rig. The controls are not toggleable, meaning you might find the viewport a bit cluttered while animating.

Available Controls:

Facial: Joint Based Only

Head and Neck: FK Only (S&S)

Spine: FK Only (S&S)

Arms: FK (S&S) - IK (S&S)

Fingers: FK Only (S&S)

Legs: FK (S&S) - IK (S&S)

Feet: FK Only (S&S)

Extra: FK Clothing (S&S) - FK Hair (S&S)

Compatibility

Works with Maya 2015 and up.

Download it here for free or buy the commercial version for $99

Credit: CharacterRigs.com

CHAPTER 04

Lyette Character Rig

The Lyette rig is designed for game animations and is pretty simple to use when doing keyframe animation. While its unconventional skeleton makes for easier keyframe animations, it can throw up errors when doing motion capture. This character rig is only for editorial use.

Skeletal System

The skeleton system is rather simplistic in design and the majority of its complex appearance comes from separate free-floating twist-deformation bones, and cloth joints. It is easy to trace each bone segment and what it achieves within the rig. The only unexpected design of the skeletal system is the free-floating spine joints.

Controls

The control setup for this character is overall pretty good. It is easy to identify what each specific control does and they are even colour coded for easy recognition. The only problem is the clutter of the controls as there are no togglable visibility layers to remove unused or needed controls — this must be done directly in the FK/IK blending control. The FKspine also has some NURBs clipping issues with the mesh.

Available Controls:

Facial: FACs Only

Head and Neck: FK Only (S&S)

Spine: FK (S&S) - IK (S&S)

Arms: FK (S&S) - IK (S&S)

Fingers: FK Only (S&S)

Legs: FK (S&S) - IK (S&S)

Feet: FK Only (No Toe Bend)

Extra: None

Compatibility

Works with Maya 2014 and up.

Download it here for $55

Credit: Kiel Figgings

CHAPTER 04

Fan-made Judy Hopps Character Rig

The Judy Hopps rig is a well-produced character rig utilizing Rapid Rig Modular as its main rigging pipeline. You have access to pretty much all standard modern control rig features in order to achieve any stylistic or realistic movement they want.

While this free rig has no use restrictions on it, it's wise to remember that the character belongs to Pixar.

Skeletal System

Overall, the skeletal system for this character is fairly simple but well developed. It follows a typical humanoid-style biped skeleton, with a large number of twist joints.

Controls

The controls are, in summary, easy and quick to use for anyone familiar with animation. The added function of twist controls means that the animator can manually correct mesh deformation on the limbs as they see fit. The facial rig is especially easy to understand.

Available Controls:

Facial: Joint Based Only

Head and Neck: FK Only (S&S)

Spine: FK (S&S) - IK (S&S)

Arms: FK - IK (S&S)

Fingers: FK - Attribute Sliders

Legs: FK - IK (S&S)

Feet: Fk Only

Extra: None

Compatibility

Works with Maya 2017 and up.

Download it here for free

Credit: MahmoudGXF

CHAPTER 05

Best Blender Rigs

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CHAPTER 05

Vincent Character Rig

While the Vincent rig comes with a learning curve, it's an excellent introduction to Blender's comprehensive rigging controls. The rig works with squash and stretch, but doesn't include the bendy bones so often seen in stylized characters.

Skeletal System

Despite having complex manipulation options, the skeletal system for the Vincent rig is simplistic and rather sparse. An interesting side note is that the pole vectors for the IK system are attached directly to the knee joints.

Controls

The main focus point of this control rig is the "Picker System" that has been implemented.
It gives the user to complete control over the character rig, allowing them to enable all the animation features they deem necessary.

Available Controls:

Facial: Joint Based Facial Rig

Head and Neck: FK (S&S) - IK (S&S)

Spine: FK (S&S) - IK (S&S)

Arms: FK (S&S) - IK (S&S)

Fingers: FK Only (S&S)

Legs: FK (S&S) - IK (S&S)

Feet: FK Only (S&S)

Extra: FK Hair (S&S)

Compatibility

Works with Blender v2.8

Download it here for free

Credit: Andy Goralczyk & Juan Pablo Bouza

CHAPTER 05

Rain v2.0 Character Rig

Skeletal System

Underneath the hood of the Rain v2.0 rig you'll find a standard biped skeletal structure. One additional bone per limb segment assists with mesh deformation and squash and stretch.

There are no chest bones included in the torso — not a big issue for basic animations. The basic structure of this rig makes it suitable for both keyframe and motion capture animation.

Controls

While the options at your fingertips are advanced, the controls themselves are surprisingly intuitive.

Available Controls:

Facial: Joint Based Facial Rig

Head and Neck: FK Only (S&S)

Spine: FK (S&S) - IK (S&S)

Arms: FK (S&S) - IK (S&S)

Fingers: FK Only (S&S)

Legs: FK (S&S) - IK (S&S)

Feet: FK Only (S&S)

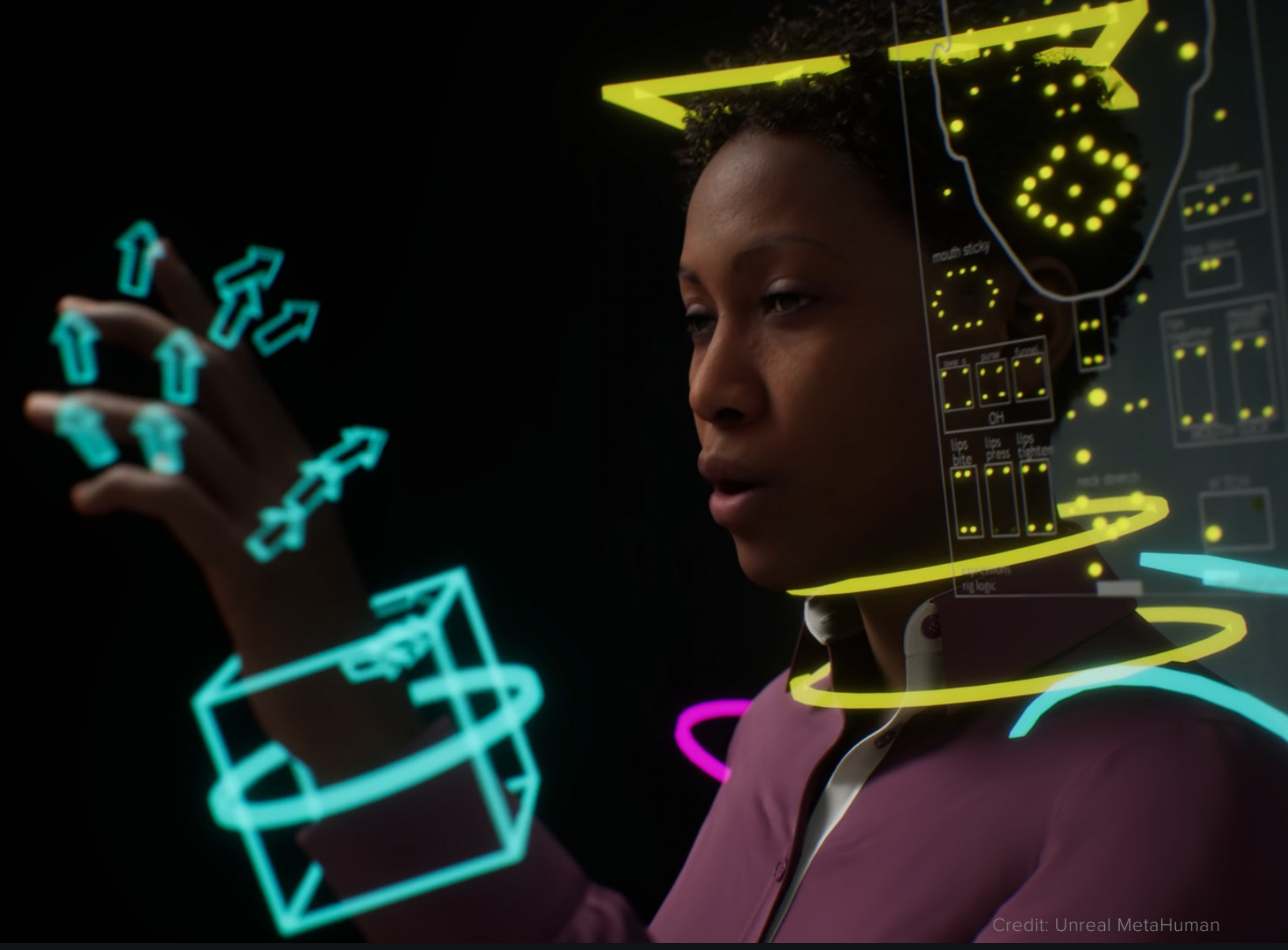
Extra: FK Hair (S&S) - FK Clothing (S&S)

Compatibility

Works with Blender v2.8

Download it here for free

Credit: Demeter Dzadik



Credit: Unreal MetaHuman

CHAPTER 06

So Which Rig Should You Choose?

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So What Makes a Character Rig Good or Bad?

There are many factors that could make or break (pun intended) a rig.

At a basic level, you want to make sure the rig can move in all the ways you need it to without breaking or the mesh looking weirdly distorted. And if at any point it does, you'll want all those corrective controls and attribute sliders to help you out.

On the flip side, a good rig shouldn't be too complex either. If there's hundreds of tiny dials you need to tweak just to get a good pose — you're in for a lot of wasted time.

Lastly you want to check the basic orientation of the joints. Your rotation order should be XYZ to allow for full range of motion. And when your control rig is set to zero, your character should ideally be standing in a T-pose.

Our choice

If you're brand spanking new to character animation, you can't go wrong with the good ol' flour sack. It's taught generations of animators how to hone their character movements.

But, if you're searching for something a little more sophisticated, Azri is an excellent option. It's a simple rig, versatile enough for both game and short film animation, and free to use.

And for you experts out there — you probably already know what to choose ;)

Motion Capture

Keyframe animation is great, but it can be a bit tedious. There are no shortcuts in the 3D world - only better workflows. (CTA for plugin or mocap library???)

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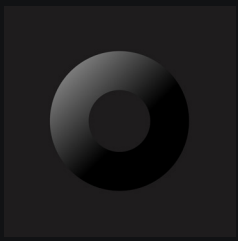
So Now What, You're Thinking

Well, here are three great ways to dive deeper into character animation and motion capture:



Breathe Life to your Characters in Rokoko Studio

Rokoko Studio is our free software enabling real-time 3D character animation. Record, clean, and edit your motion capture data and then either export or stream directly into your tools with our easy-to-use plugins.

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